



June 30, 2022

East Town Crossing, LLC

Attn: Gil Hulsmann, CEO

1001 Shaw Rd

Puyallup, WA 98571

gil.hulsmann@AbbeyRoadGroup.com

(253) 604-4982

cc: Dan Lloyd

dlloyd1124@gmail.com

Subject: East Town Crossing – Response to City’s Review Comments

2902 E. Pioneer, Puyallup, WA 98372

Pierce County Parcel # 0420264021, Puyallup, WA

MTC Project No.: **22S075**

Dear Mr. Hulsmann:

This letter transmits our letter report responding to City of Puyallup’s review comments for the above-referenced project. Materials Testing & Consulting, Inc. (MTC) performed this task in accordance with our Change Order for Geotechnical Services, dated June 15, 2022.

We would be pleased to continue our role as your geotechnical engineering consultants during the project phases of planning and construction. We also have a keen interest in providing materials testing and special inspection during construction of this project. We will be pleased to meet with you at your convenience to discuss these services.

We appreciate the opportunity to provide geotechnical engineering services to you for this project. If you have any questions regarding this report, or if we can provide assistance with other aspects of the project, please contact MTC at (360) 755-1990.

Respectfully Submitted,

MATERIALS TESTING & CONSULTING, INC.

Marcus Van Valen, E.I.T.

SW Geotechnical Division Manager

Medhanie Tecele, P.E.

Principal Engineer

Environmental • Geotechnical Engineering • Special Inspection • Non-Destructive Testing • Materials Testing

Burlington | Olympia | Bellingham | Silverdale | Tukwila
360.755.1990

www.mtc-inc.net

Table of Contents

1.0	SITE DISCUSSION	3
1.1	CRITICAL AREAS REVIEW	3
1.2	LIQUEFACTION HAZARD ANALYSIS	3
1.3	STORMWATER INFILTRATION RATE	5
1.4	STORMWATER INFILTRATION FEASIBILITY	5
1.5	ON-SITE LATERAL FLOWS.....	5
2.0	LIMITATIONS.....	7
	<i>Appendix A. Laboratory Test Results</i>	<i>9</i>
	<i>Appendix B. MTC Field Reports.....</i>	<i>11</i>
	<i>Appendix C. Liquefaction Analyses Reports.....</i>	<i>16</i>

1.0 SITE DISCUSSION

1.1 CRITICAL AREAS REVIEW

According to the *Liquefaction Susceptibility Map of Pierce County, Washington* (Palmer et al., 2004), the site vicinity is identified as having a *high* liquefaction susceptibility. The accompanying *Seismic Site Class Map* (Palmer et al., 2004) classifies the project and regional vicinity as *Site Class D to E*.

The site and the immediate vicinity are dominated by areas mapped by Pierce County as moderate to high liquefaction hazard zones. The medium dense consistency, depth to groundwater, and mechanics of these soil types yield generally low settlement concerns related to liquefaction.

The *OSHPD Seismic Design Map Tool* was used to determine site-specific seismic design coefficients and spectral response accelerations for the project site assuming design Site Class D, representing a sensitive subsurface profile including approximately 10 feet or more of soft soils in the upper 25 feet. Parameters in Table 1 were calculated using 2008 USGS hazard data and 2018 International Building Code standards. ASCE 7-16 Standard was referenced for the site Peak Ground Acceleration:

Table 1. Seismic Design Parameters – Site Class D

Mapped Acceleration Parameters (MCE horizontal)	S _S	1.254 g
	S _I	0.432 g
Site Coefficient Values	F _a	1.200
	F _v	1.500
Calculated Peak SRA	S _{MS}	1.505 g
	S _{M1}	0.648
Design Peak SRA (<i>2/3 of peak</i>)	S _{DS}	1.003 g
	S _{D1}	0.432
MCE Peak Ground Acceleration Maximum (PGA _M)		0.600 g
Seismic Design Category – Short Period (0.2 Second) Acceleration		D
Seismic Design Category – 1-Second Period Acceleration		D

Based on the findings of this study, the site is generally considered to have a moderate to high risk of liquefaction-induced settlement.

1.2 LIQUEFACTION HAZARD ANALYSIS

MTC performed a site-specific analysis of liquefaction susceptibility and resulting ground subsidence from available site exploration data provided by the original geotechnical report completed by Krazan & Associates on April 11, 2019.

Analysis was completed using LiquefyPro, Version 5.8h, published by CivilTech Software©. LiquefyPro performs liquefaction settlement analysis in accordance with the latest National Center for Earthquake Engineering Research (NCEER) Workshop recommended procedures and provides several options for the treatment of data inputs. Modeling was performed using both the methods dictated by Tokimatsu and Seed (1987) and the methods dictated by Ishihara and Yoshimine (1990). In all simulations, a 7.0 magnitude earthquake event was applied. Calculations were completed using maximum peak ground acceleration of 0.600 g as provided by USGS resources, in accordance with ASCE 7-16 guidelines. To most accurately reflect liquefaction risk of existing conditions, no factor of safety, external surface load, or other ground disturbance was applied. Table 2 summarizes the results of MTC’s liquefaction analysis. Full outputs of MTC LiquefyPro results are presented in Appendix C.

Table 2. Summary of Liquefaction-induced Settlement Estimates and Inputs

ANALYSIS SCENARIO	B-1	B-2	B-3
Total Settlement Potential: Ishihara and Yoshimine (1990)	3.89 inches	5.10 inches	4.38 inches
Total Settlement Potential: Tokimatsu and Seed (1987)	2.89 inches	3.93 inches	3.08 inches
Anticipated Max Water Table	7.0 feet BPG*	7.0 feet BPG*	6.0 feet BPG*
Earthquake Magnitude	7.0 M _L		
MCE Peak Ground Acceleration	PGA _m = 0.600 g		
Factor of Safety	FS = 1.0		

*BPG = Below Present Grade.

In considering settlement during liquefaction, the most critical area considered for a development of this size is the upper 20 feet of soil. In this hypothetical situation, where no ground improvements are made to the site, settlement in the order of up to 5.10 inches appears likely to occur during an earthquake.

In our opinion, this magnitude of potential seismic-induced settlement represents a moderately-high site response to liquefaction, warranting the use of deep supporting foundation mechanisms or approved alternative ground improvements. As a rule-of-thumb, differential settlement may amount to roughly half of total vertical settlement over 50 feet. Given the calculated total settlement values of up to around 5.10 inches, as much as about 2.55 inches is estimated for potential differential settlement resulting from liquefaction across the building site. It is advisable that additional reinforcements be added to concentrated load foundations as a discretionary measure to counteract differential settlement in the event of a seismic event.

per MTC report dated April 13, 2022,
Falling Head tests were conducted.
[MTC Letter 6/30/22; Pg 5]

1.3 STORMWATER INFILTRATION RATE

MTC performed small-scale Pilot Infiltration Testing (P.I.T.) as part of our site exploration activities conducted on April 13, 2022. At the time of testing, the contractor had prepared and compacted (4) testing pads, each with a different soil composition and supplier. MTC performed small-scale PIT testing on each soil pad in order to determine the infiltration rate of each soil type, and generally confirm the selected soil will meet the design infiltration rate of 2.0 inches per hour.

After field testing and the application of the appropriate correction factors, as determined by MTC's principal engineer, and further corroborated by the project civil engineer, the contractor selected Des Moines Pit Run with 33% Glass as the import soil of choice.

Field testing of this soil determined the average uncorrected infiltration rate to be approximately 164.1 inches per hour. Reductions to the uncorrected infiltration rate by applying the chosen correction factors resulting in a *corrected infiltration rate of 52.3 inches per hour, which meets/exceeds the project design infiltration rate of 2.0 inches per hour.*

also adequate separation
[MTC Letter 6/30/22; Pg 5]

1.4 STORMWATER INFILTRATION FEASIBILITY

On June 20, 2022, MTC received two samples of the selected fill soils, which were delivered to the MTC Laboratory by the contractor, for additional laboratory testing. Per Puyallup city codes, standards, as well as the locally accepted ecology manual stipulate that the proposed development must provide sufficient technical information to allow finding that stormwater design is viable. These stipulations include demonstration of an adequate hydraulic conductivity (i.e. infiltration rate), as well as demonstrating the ability of the selected engineered fill to provide water quality treatment for the pollution generating surfaces. The selected soil, Des Moines Pit Run with 33% glass was submitted to the laboratory for cation exchange capacity and organic matter testing.

The selected fill must comply with the Soil Suitability Criteria outlined in Department of Ecology Manual, Section 3.3.7, SSC-6. According to *Site Suitability Criteria (SSC)-6*, soils meeting a minimum CEC target of 5 meq/100g may be accounted as treatment media without modification. The minimum thickness for infiltration treatment soils is 18 inches or greater. Finally, treatment soils are expected to contain at least 1.0% organic content. *The selected fill soils were found to have a Cation Exchange Capacity of 5.9 meq/100g and an Organic Content of 1.2% and therefore is considered suitable medium for treatment.*

1.5 ON-SITE LATERAL FLOWS

As described in the original geotechnical report produced by Krazan & Associates, the site currently exists in the Puyallup River valley and is a generally level lot, with no significant topographic features in

the immediate vicinity. A survey of the greater vicinity identified hilly regions approximately 0.20 mi to the South and the Puyallup River, approximately 1.0 mi to the North.

MTC was provided a preliminary site plan by The Abbey Road Group, dated 05/17/2022. Plans provided show; (7) 3-story, 24-unit apartment buildings; ancillary structures such as maintenance buildings and a club house; associated site improvements such as carpools, picnic and exercise courtyards, as well as paved surfaces, including pervious and impervious pavements.

Exploratory drilling, conducted by Krazan & Associates in March of 2019 as part of their geotechnical investigation of the site, and further published in their geotechnical report dated April 11, 2019 (provided to MTC in June of 2022) identifies the majority of subsurface soils onsite as alluvium deposits consisting of interbedded silt, sandy silt, silty sand, sand, and gravel with localized areas of peat and clay.

The USDA NRCS Web Soil Survey maps the majority of the property as *Briscot Loam* (0 to 2 percent slopes). It is typically formed on flood plains over a parent material of alluvium. A typical soil profile is described as loam to a depth of 11 inches BPG, stratified fine sand to silt loams to a depth of 38 inches BPG, and sand to a depth of 60 inches BPG. This soil unit is considered to be poorly drained with a moderately high to high capacity to transmit water (0.57 to 1.98 in/hr). Depth to the water table is listed as being about 12 to 35 inches, and restrictive layers consisting of a strongly contrasting textural change are listed as more than 80 inches.

MTC's scope of investigation did not include observation and determination of seasonal variations or conclusive measurement or monitoring of groundwater elevations. However, based on the geologic and topographic features of the site, as well as the provided site plan, *onsite lateral stormwater flows will generally be directed to the North or West, away from the critical areas to the south and will not cause the erosion or deterioration of downstream properties.*

In general, the results of MTC's investigation indicate that site soil conditions as a whole present favorable conditions for conventional on-site infiltration design. The soils observed strongly correlate with geologic mapping in the area and exploratory drilling conducted in the spring of 2019. The reported relatively shallow groundwater table, reported as shallow as 7.0 feet BPG in the area, could present additional limitations.

Krazan subsequently revised the groundwater depth to 3ft bgs based on monitoring well results. [MTC Letter 6/30/22; Pg 6]

2.0 LIMITATIONS

Recommendations contained in this letter are based on our understanding of the proposed development and construction activities, our field observations and exploration and our laboratory test results. It is possible that soil and groundwater conditions could vary and differ between or beyond the points explored. If soil or groundwater conditions are encountered during construction that vary or differ from those described herein, we should be notified immediately in order to review and provide supplemental recommendations. If the scope of the proposed construction, including the proposed loads or structural locations, changes from that described in this letter, we should be notified to review and provide supplemental recommendations.

We have prepared this letter in substantial accordance with the generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty, expressed or implied, is made. The recommendations provided in this letter are based on the assumption that an adequate program of tests and observations will be conducted by MTC during the construction phase in order to evaluate compliance with our recommendations.

This letter may be used only by the Client and their design consultants and only for the purposes stated within a reasonable time from its issuance, but in no event later than 18 months from the date of the letter. It is the Client's responsibility to ensure that the Designer, Contractor, Subcontractors, etc. are made aware of this letter in its entirety. Note that if another firm assumes Geotechnical Engineer of Record responsibilities they need to review this letter and either concur with the findings, conclusions, and recommendations or provide alternate findings, conclusions and recommendation under the guidance of a professional engineer registered in the State of Washington.

Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required. Based on the intended use of the letter, MTC may recommend that additional work be performed and that an updated letter be issued. Non-compliance with any of these requirements by the Client or anyone else will release MTC from any liability resulting from the use of this letter. The Client, the design consultants, and any unauthorized party agree to defend, indemnify, and hold harmless MTC from any claim or liability associated with such unauthorized use or non-compliance. We recommend that MTC be given the opportunity to review the final project plans and specifications to evaluate if our recommendations have been properly interpreted. We assume no responsibility for misinterpretation of our recommendations.

The scope of work for this letter did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

The information included in this letter should be considered supplemental to the information contained in the original field report (MTC Report #F278686, dated 04/01/2022) and supplemental field report (MTC Report # F279450, dated 04/13/2022) and, as such, should be read in conjunction with the above referenced report. The selected recommendations presented in this letter are intended to supersede only the specific corresponding recommendations contained in the referenced reports. All other recommendations of the above-mentioned reports remain valid, unless otherwise specified herein.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranties, either express or implied, are intended or made. We trust this addendum satisfies your requirements at this time; however, should you have any questions, please do not hesitate to call.

Mr. Hulsmann, we trust this letter report presents the information you require. If you have questions, please do not hesitate to call.

Respectfully Submitted,
Materials Testing and Consulting, Inc.



Marcus L. Van Valen, E.I.T.
Geotechnical Division Manager



06/30/2022

Medhanie Teclé, P.E.
Engineering Manager



06/30/2022

Jason W. Center

Jason W. Center, L.G.
Project Geologist

Appendix A. Laboratory Test Results

Materials Testing & Consulting, Inc.

Geotechnical Engineering • Special Inspection • Materials Testing • Environmental Consulting



Project: East Town Crossing	Date Received: June 20, 2022
Project #: 22S075	Date Sampled: June 20, 2022
Client: Dan Lloyd	Sampled By: Client
Source: Des Moines # 06171, Pit Run with Glass	Date Tested: June 22, 2022
Sample#: See Below	Tested By: Mark Peterson

Moisture Content - ASTM C-566, ASTM D-2216 & AASHTO T-265

Sample #	Location	Tare	Wet + Tare	Dry + Tare	Wgt. Of Moisture	Wgt. Of Soil	% Moisture
S22-0255	Laboratory	186.3	883.3	854.2	29.1	667.9	4.4%

Organic Content - ASTM D-2974, AASHTO T-267

Sample #	Location	Tare	Soil + Tare, Pre-Ignition	Soil + Tare, Post Ignition	% Organics
S22-0255	Laboratory	3041.2	3708.5	3700.6	1.2%

All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Reviewed by: Mark Peterson

Corporate ~ 777 Chrysler Drive • Burlington, WA 98233 • Phone (360) 755-1990 • Fax (360) 755-1980
 Regional Offices: Olympia ~ 360.534.9777 Bellingham ~ 360.647.6111 Silverdale ~ 360.698.6787 Tukwila ~ 206.241.1974
 Visit our website: www.mtc-inc.net



2925 Griggs Dr., Moses Lake, Wa 98837 - www.soiltestlab.com
 Office: (509)765-1622 - Fax: (509)765-0314 - (800)764-1622

MATERIALS TESTING		Date Received: 6/21/2022
777 CHRYSLER DR		Grower:
Burlington, WA 98233		Field: SOIL WITH GLASS
Laboratory #: S22-11260		Sampled By:
		Customer Account #:
		Customer Sample ID:

Soil Test Results

Cation Exchange	CEC	meq/100g	5.9	pH 1:1		
				E.C. 1:1	m.mhos/cm	
				Est Sat Paste E.C.	m.mhos/cm	
				Effervescence		<u>Lbs/Acre</u>
				Ammonium - N	mg/kg	
				Organic Matter W.B.	%	ENR:

Other Tests:

We make every effort to provide an accurate analysis of your sample. For reasonable cause we will repeat tests, but because of factors beyond our control in sampling procedures and the inherent variability of soil, our liability is limited to the price of the tests. Recommendations are to be used as general guides and should be modified for specific field conditions and situations. Note: "u" indicates that the element was analyzed for but not detected

This is your Invoice #: S22-11260 Account #: 234500 Reviewed by: James Graff List Cost: \$13.00

Appendix B. MTC Field Reports



East Town Crossing - 22S075 - Field Report: Geotechnical consulting: Report #F278686

CLIENT Dan Lloyd **DATE** 04/01/2022
PROJECT LOCATION Intersection of Shaw Road East and East Pioneer Puyallup WA 98372 **PERMIT #**

Inspection Information:

Inspection Date: 04/01/2022 **Time Onsite:** 1100 **Weather Conditions:** 50F, Partly Cloudy
Inspection Performed: Geotechnical consulting

Comments:

Report of Infiltration Test - Infiltration

MTC Staff Geologist visited the site to perform limited shallow infiltration testing in accordance with the Falling Head Percolation Test Procedure (US EPA 1980), as requested by the contractor, in order to demonstrate that the import soils generally conform with design infiltration rates.

Contractor had prepared and compacted four (4) testing pads, approximately 12 to 18 inches thick and 5'L x 5'W, prior to MTC's arrival. MTC conducted a total of three (3) falling head infiltration tests between two (2) locations on each pad. Testing locations were free of standing water at the time of our visit. Holes were prepared in accordance with EPA standards. The prescribed soaking period was determined to be unnecessary based on the sandy/gravelly nature of the soils. Testing locations were continuously observed to measure cumulative head fall.

Des Moines Pit Run w/ Glass (33%) - These observed import soils appeared to be moderately-well draining, Well-Graded Sand with moderate amounts of gravel and cobbles, some fines content, and a significant amount of glass shards.

- Field test results of this soil yielded **uncorrected** field infiltration rates of:
 - 205.7 in/hr
 - 112.5 in/hr
 - 174.2 in/hr

Miles Pit Run - Gravel Borrow - These observed import soils appeared to be moderately-well draining, Poorly-Graded gravel with a moderate amount of sand and few fines.

- Field test results of this soil yielded **uncorrected** field infiltration rates of:
 - 480.0 in/hr
 - 240.0 in/hr
 - 348.4 in/hr

Miles Pit Run - Gravel Borrow w/ Glass - These observed import soils appeared to be moderately-well draining, Poorly-Graded gravel with a moderate amount of sand, few fines and some glass shards.

- Field test results of this soil yielded **uncorrected** field infiltration rates of:
 - 981.8 in/hr
 - 617.1 in/hr
 - 674.5 in/hr

Corliss/Miles Gravel Borrow Mix - These observed import soils appeared to be moderately-well draining, Poorly-Graded Sand with Gravel and few fines.

- Field test results of this soil yielded **uncorrected** field infiltration rates of:
 - 106.4 in/hr
 - 322.4 in/hr
 - 225.0 in/hr

As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Environmental • Geotechnical Engineering • Special Inspection • Non-Destructive Testing • Materials Testing

Burlington|Olympia|Bellingham|Silverdale|Tukwila
360.755.1990

www.mtc-inc.net



All field test results are to be further reduced by correction factors by the Geotechnical Engineer of Record as stipulated in the locally-accepted stormwater manual, utilizing a minimum safety factor of 0.5.

Uncorrected field test results indicate the maximum design infiltration rate of 30 in/hr may be used for each of the inport soils.

MTC's assessment did not include: evaluation of underlying soil consistency or variability, rounding analysis, verification of depth to a static water level, or depth to impermeable soil units. Falling Head tests are limited but typically considered suitable for confirmation of infiltration potential in reasonably consistent soil conditions with no confining soils or shallow water table. If greater confidence or accuracy is required, further testing may be necessary.

MTC assumes the geotechnical engineer of record, and project civil engineer will review to confirm these findings and evaluate final correction factors if necessary.

Images:



UPLOADED: 04/04/2022 14:05:26 Des Moines Pit Run w/ Glass (33%)



UPLOADED: 04/04/2022 14:07:45 Miles Pit Run - Gravel Borrow

For a full and complete listing of public use conditions, all reports are available on the contractor's property of data, use and other for publication of materials, conditions or a more thorough and complete listing of use approval.

Environmental - Geotechnical Engineering - Special Inspection - Non-Destructive Testing - Materials Testing

Burlington/Olympia/Bellingham/Silverdale/Tukwila
360.755.1990

www.mtc-inc.net



UPLOADED: 04/04/2022 14:09:55 Miles Pit Run -
Gravel Borrow w/ Glass

UPLOADED: 04/04/2022 14:13:01 Corliss/Miles
Gravel Borrow Mix

REPORTED BY: Marcus Van Valen REVIEWED BY: Medhanie Teclé, Project Manager

By using the services of MTC, the public or customer, all reports are deemed to be confidential property of MTC, and are not to be published or otherwise used for any other purpose without the prior written approval of MTC.

Environmental • Geotechnical Engineering • Special Inspection • Non-Destructive Testing • Materials Testing

Burlington/Olympia/Bellingham/Silverdale/Tukwila
360.755.1990

www.mtc-inc.net



**East Town Crossing - 22S075 - Field Report: Geotechnical consulting: Report
#F279450**

CLIENT Dan Lloyd **DATE** 04/13/2022
PROJECT LOCATION Intersection of Shaw Road East and East Pioneer Puyallup **PERMIT #**
WA 98372

Inspection Information:

Inspection Date: 04/13/2022 **Time Onsite:** N/A **Weather Conditions:** N/A
Inspection Performed: Geotechnical consulting

Comments:

Infiltration Testing Report with Corrected Infiltration Rates.

On April 1, 2022, MTC Staff Geologist visited the site to perform limited shallow infiltration testing in accordance with the Falling Head Percolation Test Procedure (US EPA 1980), as requested by the contractor, in order to demonstrate that the selected import soil, Des Moines Pit Run w/ Glass (33%), generally conforms with design infiltration rates of 2.0 in/hr.

At the time of testing, the Contractor had prepared and compacted four (4) testing pads, approximately 12 to 18 inches thick and 5' L x 5' W, prior to MTC's arrival. MTC conducted a total of three (3) falling head infiltration tests between two (2) locations on each pad. Testing locations were free of standing water at the time of our visit. Holes were prepared in accordance with EPA standards. The prescribed soaking period was determined to be unnecessary based on the sandy/gravelly nature of the soils. Testing locations were continuously observed to measure cumulative head fall. A field report containing the initial, uncorrected infiltration rates of all four (4) of the tested soils was completed previously (MTC Report #F278686).

The infiltration rates of the Selected Import Soil (Des Moines Pit Run w/ Glass) can be found below:

Des Moines Pit Run w/ Glass (33%) - Field test results of this soil yielded average uncorrected field infiltration rate of:

- 164.1 in/hr.

All field test results are to be further reduced by correction factors by the Geotechnical Engineer of Record as stipulated in the locally-accepted stormwater manual. Utilizing the average uncorrected value(s) and applying the correction factors of $F_{\text{Testing}} = 0.50$, $F_{\text{geometry}} = 0.75$, $F_{\text{plugging}} = 0.85$ for the selected soil yields **corrected field infiltration rate** of:

- 52.3 in/hr

Which meets/exceeds the project design infiltration rate of 2.0 in/hr.

NOTES:

1) MTC assumes the project civil engineer will review to confirm these findings and evaluate final correction factors, if necessary. MTC also assumes these results to be preliminary, for permit approval only. Final infiltration testing should be conducted on the compacted soils after placement.

As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval

Environmental • Geotechnical Engineering • Special Inspection • Non-Destructive Testing • Materials Testing

Burlington|Olympia|Bellingham|Silverdale|Tukwila
360.755.1990

www.mtc-inc.net



2) MTC's assessment did not include: evaluation of underlying soil consistency or variability, mounding analysis, verification of depth to a static water level, or depth to impermeable soil units. Falling Head tests are limited but typically considered suitable for confirmation of infiltration potential is reasonably consistent soil conditions with no confining soils or shallow water table. If greater confidence or accuracy is required, further testing may be necessary.

To the best of MTC inspector's knowledge, the above-described work was performed in general accordance with project specifications and approved plans.

REPORTED BY: Marcus Van Valen REVIEWED BY: Medhanie Tecele, Project Manager

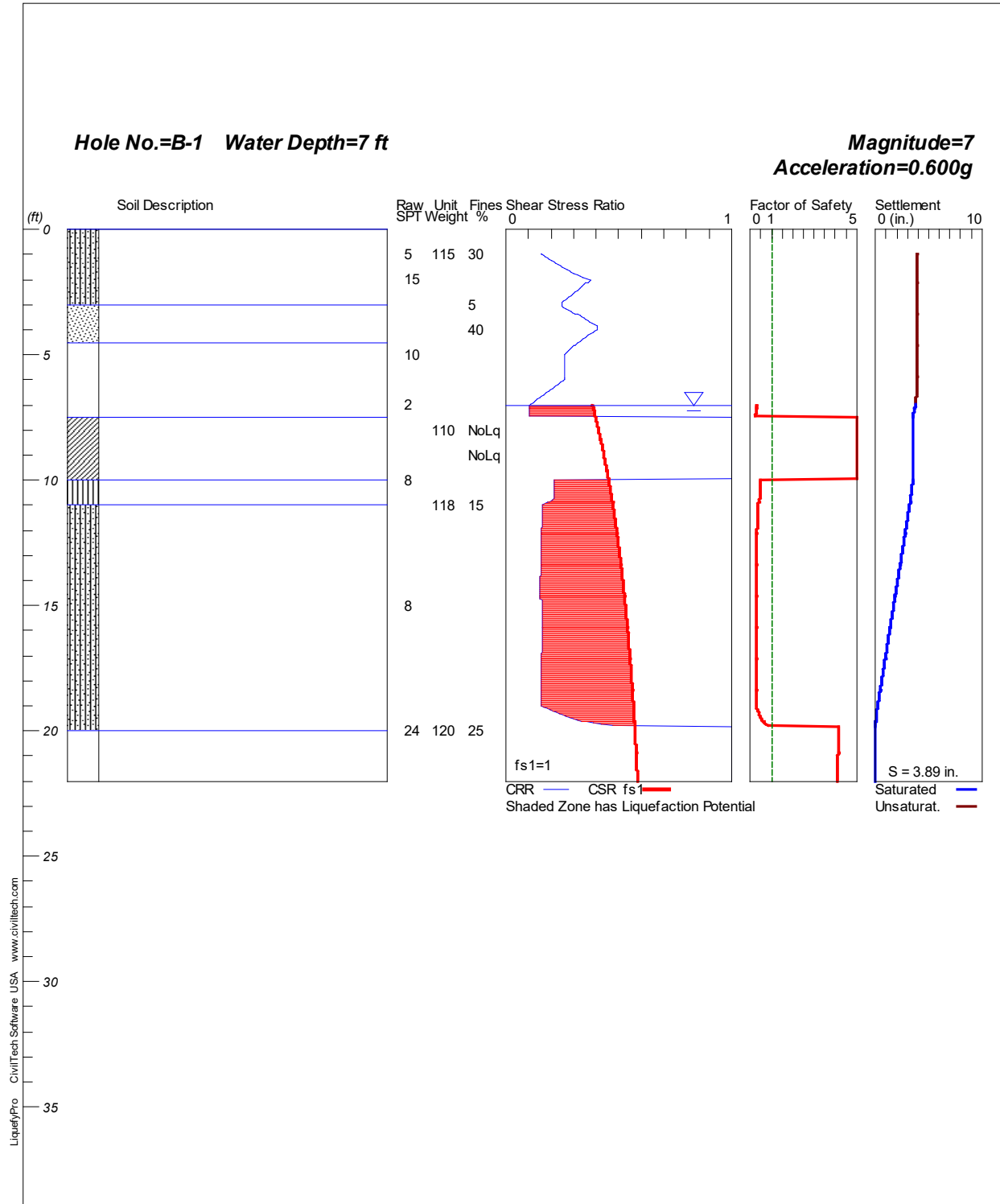
As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Environmental • Geotechnical Engineering • Special Inspection • Non-Destructive Testing • Materials Testing

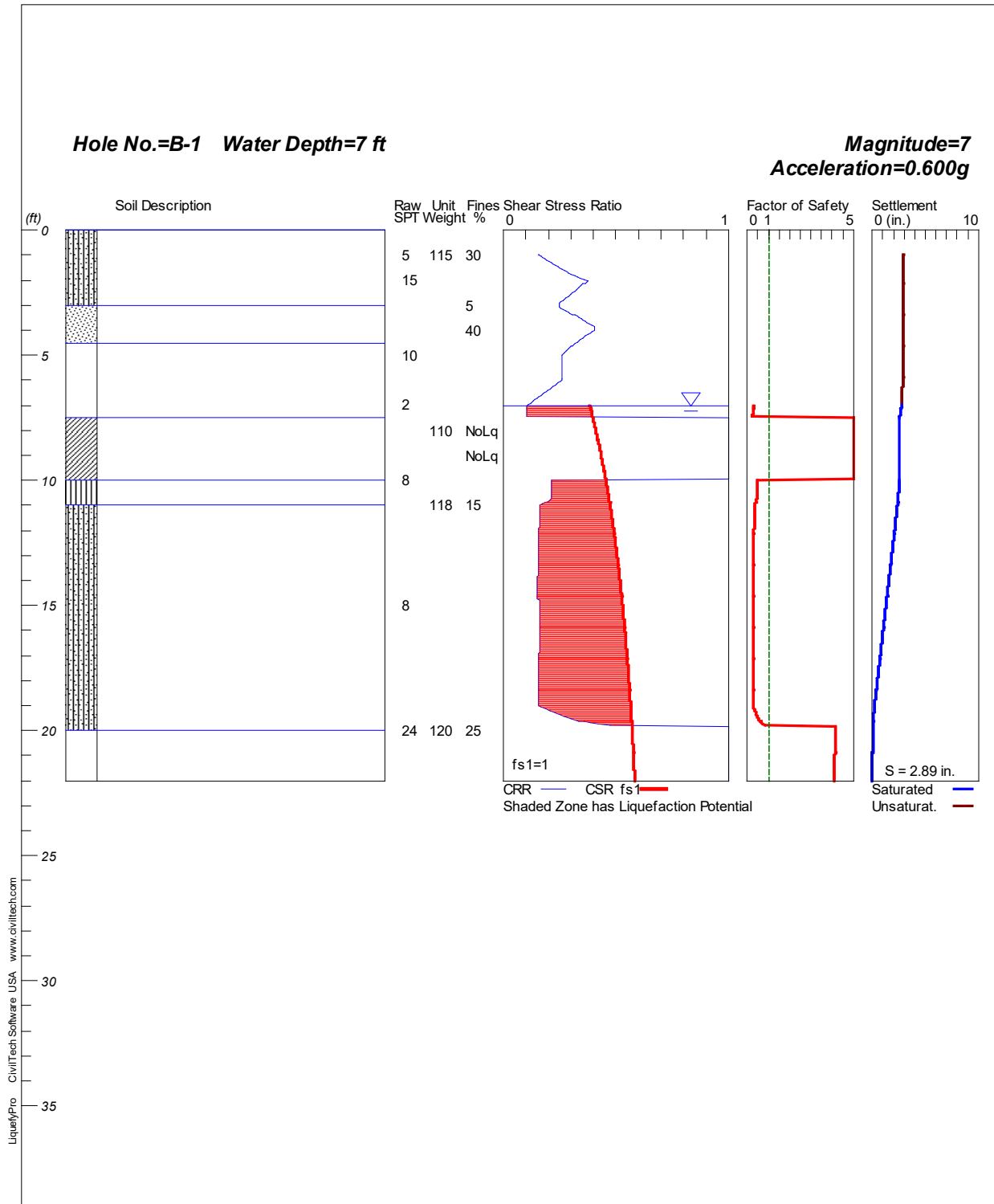
Burlington|Olympia|Bellingham|Silverdale|Tukwila
360.755.1990

www.mtc-inc.net

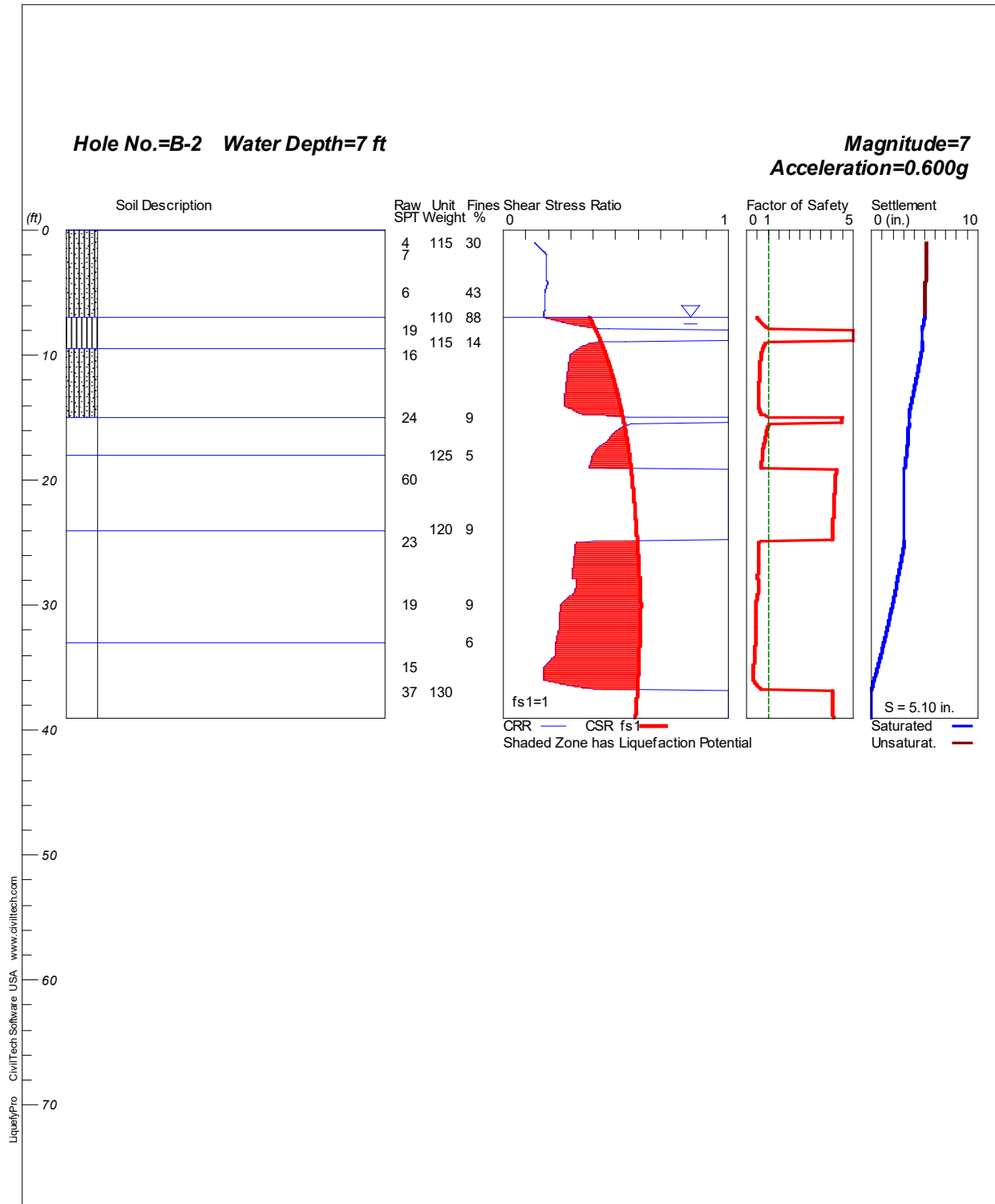
Appendix C. Liquefaction Analyses Reports



Ishihara & Yoshimine (1990)



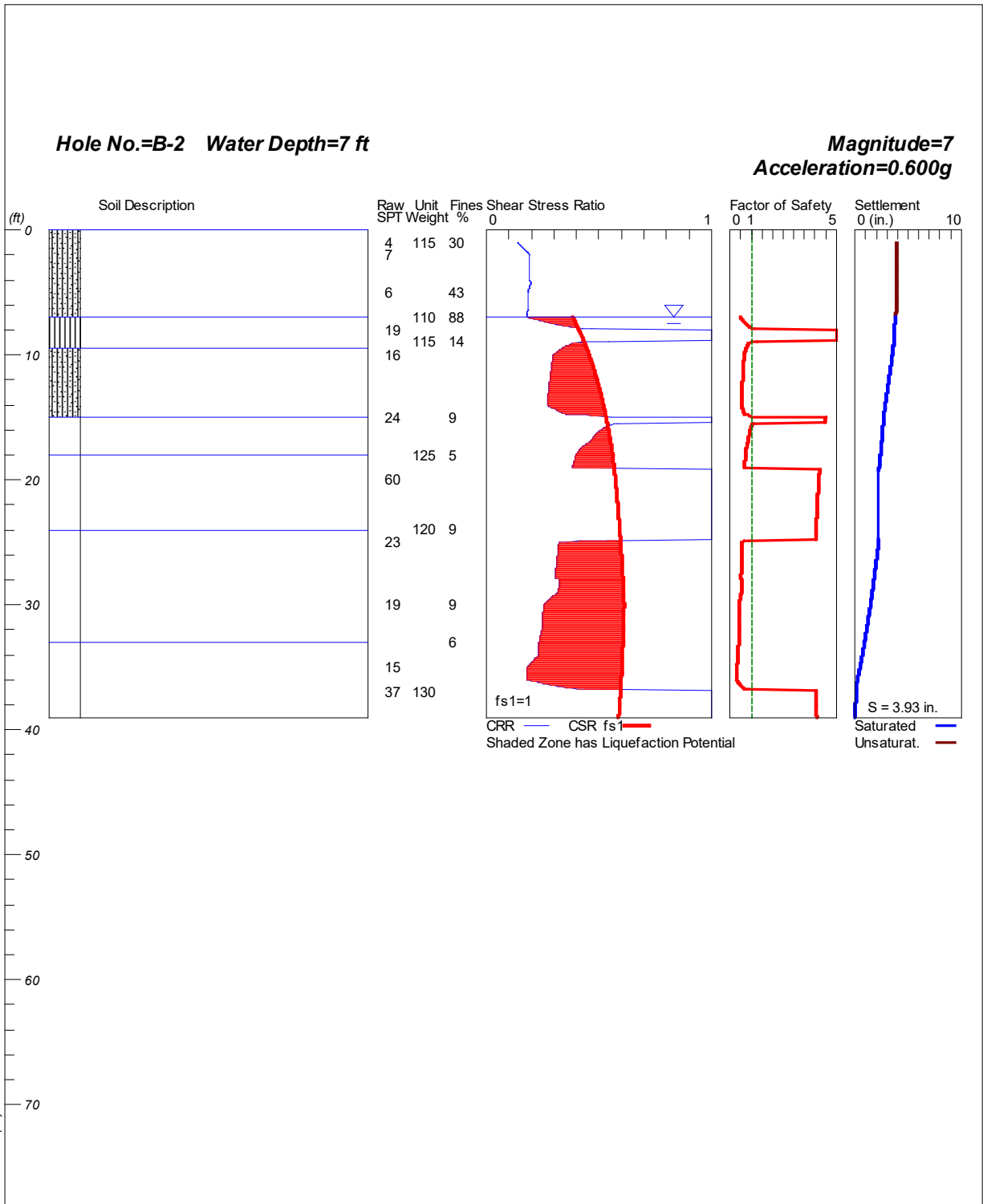
Tokimatsu and Seed (1987)



LiquefyPro CivilTech Software USA www.civiltech.com



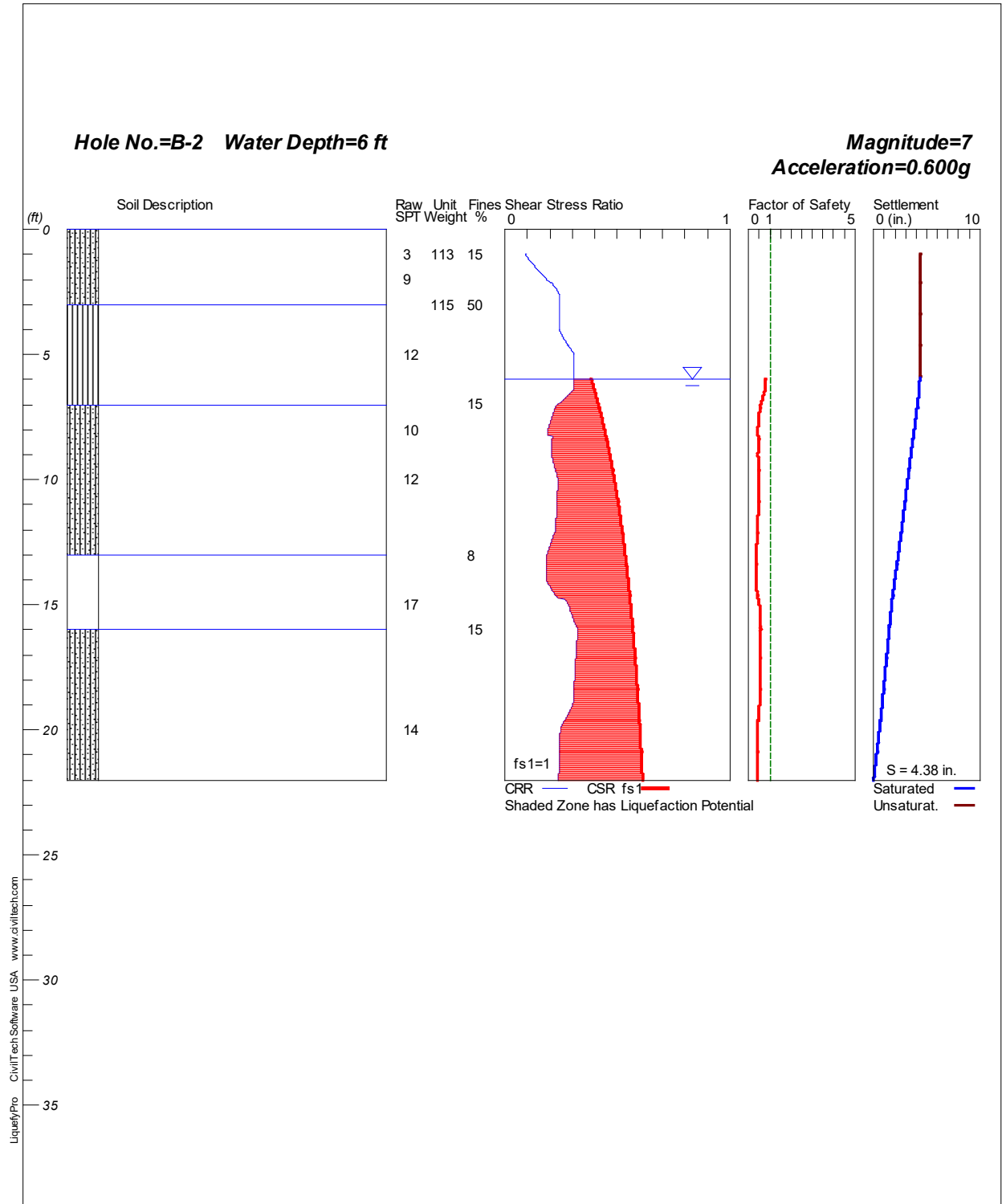
Ishihara and Yoshimine (1990)



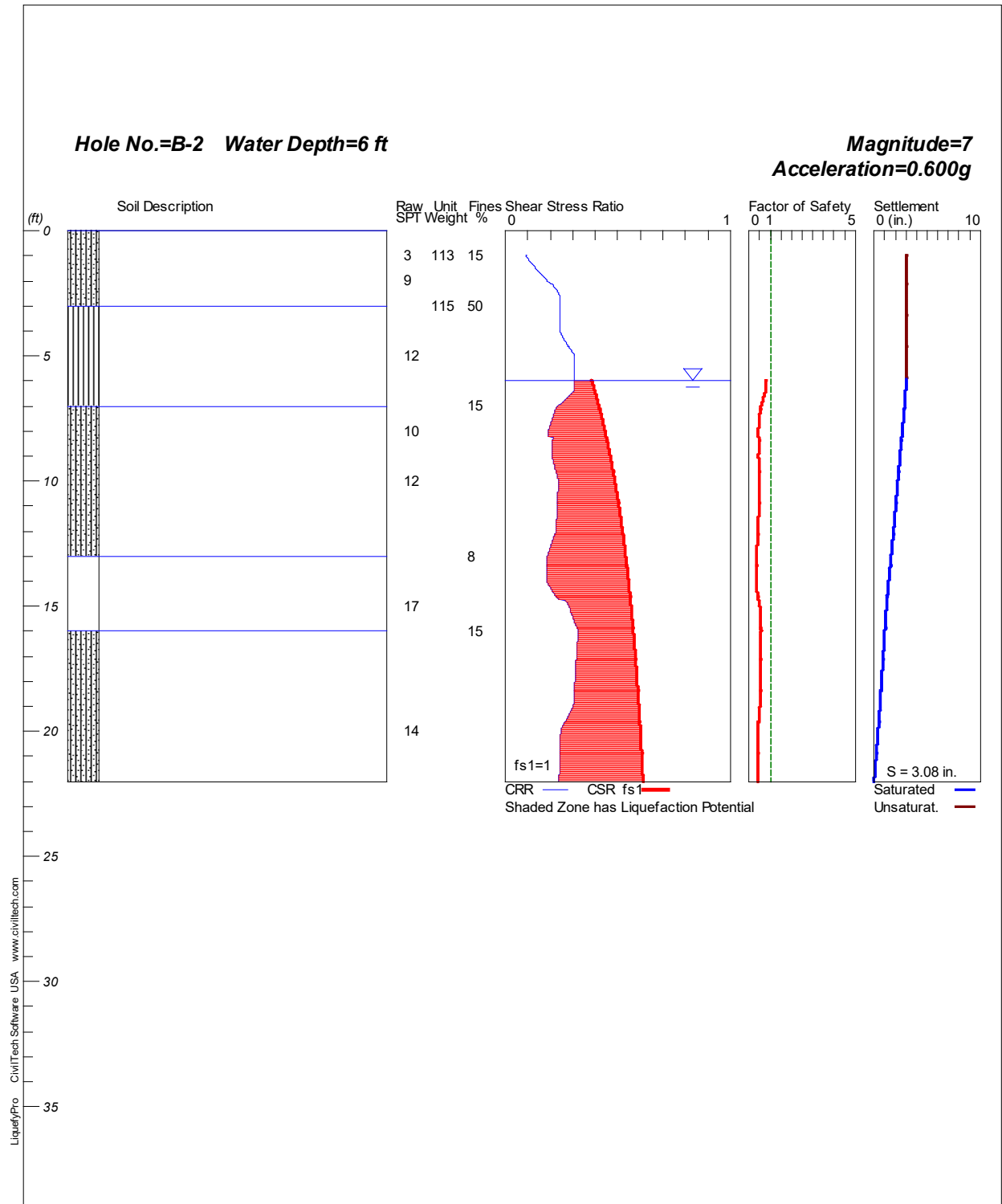
LiquefyPro CivilTech Software USA www.civiltech.com



Tokimatsu and Seed (1987)



Ishihara and Yoshimine (1990)



Tokimatsu and Seed (1987)